

# A NEW SPECIES OF MULTIPHASED *CORBULIPORA* MACGILLIVRAY, 1895 (BRYOZOA: CRIBRIOMORPHA) FROM SOUTHWESTERN AUSTRALIA.

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A new Recent species of the cribriomorph genus *Corbulipora*, *C. inopinata*, is described from several localities in the western part of the Great Australian Bight. All species of *Corbulipora*, both Recent and fossil, are known to occur in several phases. The form of the subcolonies, and the characters of the component zooids may be very different in each phase, and subcolonies are capable of separate existence. *C. inopinata* occurs in an encrusting phase, in a flustriform, ovicellate phase, and a bilaminar rooted phase. All zooids have some form of cribriomorph frontal shield, unlike some of those of the closely related *C. tubulifera*. The shield has, however, different characters in each phase.

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The occurrence of distinct phases of correlated colony growth form and zooid morphology in species of *Corbulipora* has been described in some detail by Bock and Cook (1994; in press). Essentially, the function of the phases appears to be the same in all species. The first, ancestrulate phase is minute, encrusts shells and shell fragments, and may even have an interstitial existence. It establishes the colony and results from the settlement and metamorphosis of a motile larva. The second, erect phase is cellularine or flustrine, and arises from stalk-like kenozooids and autozooids growing from the peripheral pore-chambers of the zooids of the primary phase. This phase develops ovicells and large interzooidal avicularia. The second phase gives rise in various ways to a small, bilaminar or frontally budded third phase, which is known, in Recent species, to be anchored by numerous rhizoids. As the ovicelled second phase tends to be thinly calcified, the delicate subcolonies may easily be destroyed, or at least detached from their origins. The bilaminar phase maintains the position of the colony and develops further ovicellate subcolonies, which may be able to alternate with it more than once (Bock & Cook in press).

Collections of bryozoans, made by the R.V. Franklin, using an epibenthic sled, from localities in the western Great Australian Bight in July 1995, have produced a wealth of specimens and

species. These include subcolonies of *C. tubulifera* and of an undescribed species of *Corbulipora*, which has several distinctive features.

## MATERIALS AND METHODS

Specimens are stored in the Collections of the Museum of Victoria (MOV) and South Australian Museum (SAM). Specimens for scanning electron microscopy were coated with gold.

The Stations from which specimens of *Corbulipora* were obtained were as follows:

### *C. inopinata* sp. nov.

GAB 118 34°59'S, 119°00'E, 85m. Young non-ancestrulate colonies encrusting worn adeonid and lunulite colonies of bryozoans.

GAB 098 34°39'S, 122°26'E, 156m. 1 phase-2 subcolony with numerous avicularia.

GAB 093 34°32'S, 122°58'E, 95m. 1 phase-1 subcolony and 1 phase-2 subcolony with ovicells.

GAB 083 34°21'S, 124°08'E, 180m. 2 phase-1 subcolonies encrusting *Turritella* shells.

GAB 049 33°53'S, 125°22'E, 156m. 4 phase-2 subcolonies, developing into phase-3 at tips, one repeating phase-2.

GAB 056 33°19'S, 125°43'E, 73m. 2 large phase-

2 subcolonies, one with ovicells, developing from phase-3 subcolonies.

GAB 045 33°25'S, 125°58'E, 143.5m. 3 small phase-3 subcolonies with stalks.

GAB 020 33°20'S, 129°18'E, 157m. 9 small phase-2 subcolonies, 2 developing from phase-3 subcolonies.

GAB 013 33°06'S, 130°00'E, 101m. 2 phase-2 subcolonies, one with ovicells, and one phase-3 with numerous rhizoids and one phase-2 subcolony.

GAB 014 33°16'S, 130°00'E, 155m. 2 phase-3 subcolonies developing into phase-2 subcolonies, plus 5 isolated stalks.

*C. tubulifera* (Hincks)

GAB 019 33°22'S, 129°19'E, 301m. 7 phase-2 subcolonies, and 2 phase-3 subcolonies.

SYSTEMATICS

Order Cheilostomatida Busk, 1852

Superfamily Cribrinoidea Hincks, 1879

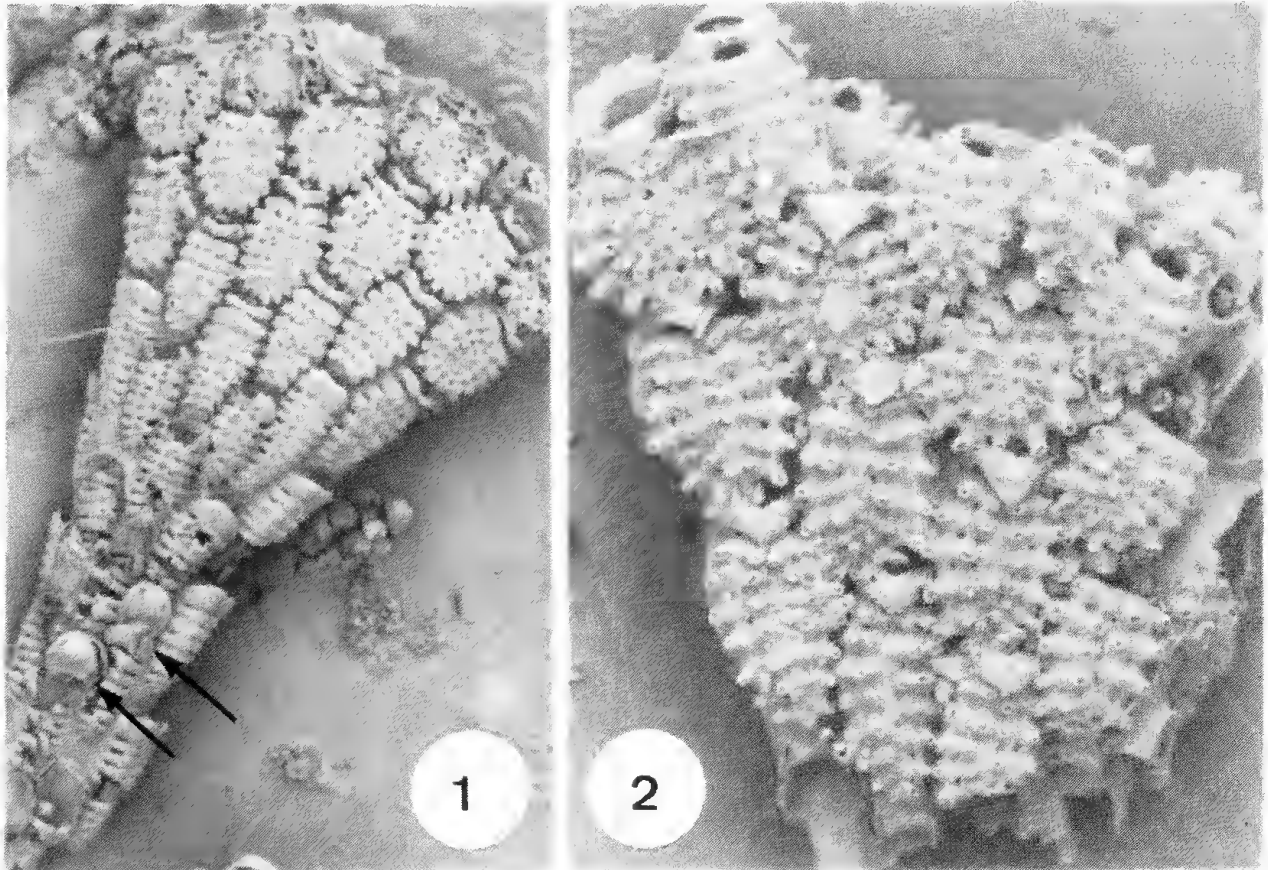
Family Cribrulinidae Hincks, 1879

Genus *Corbulipora* MacGillivray, 1895

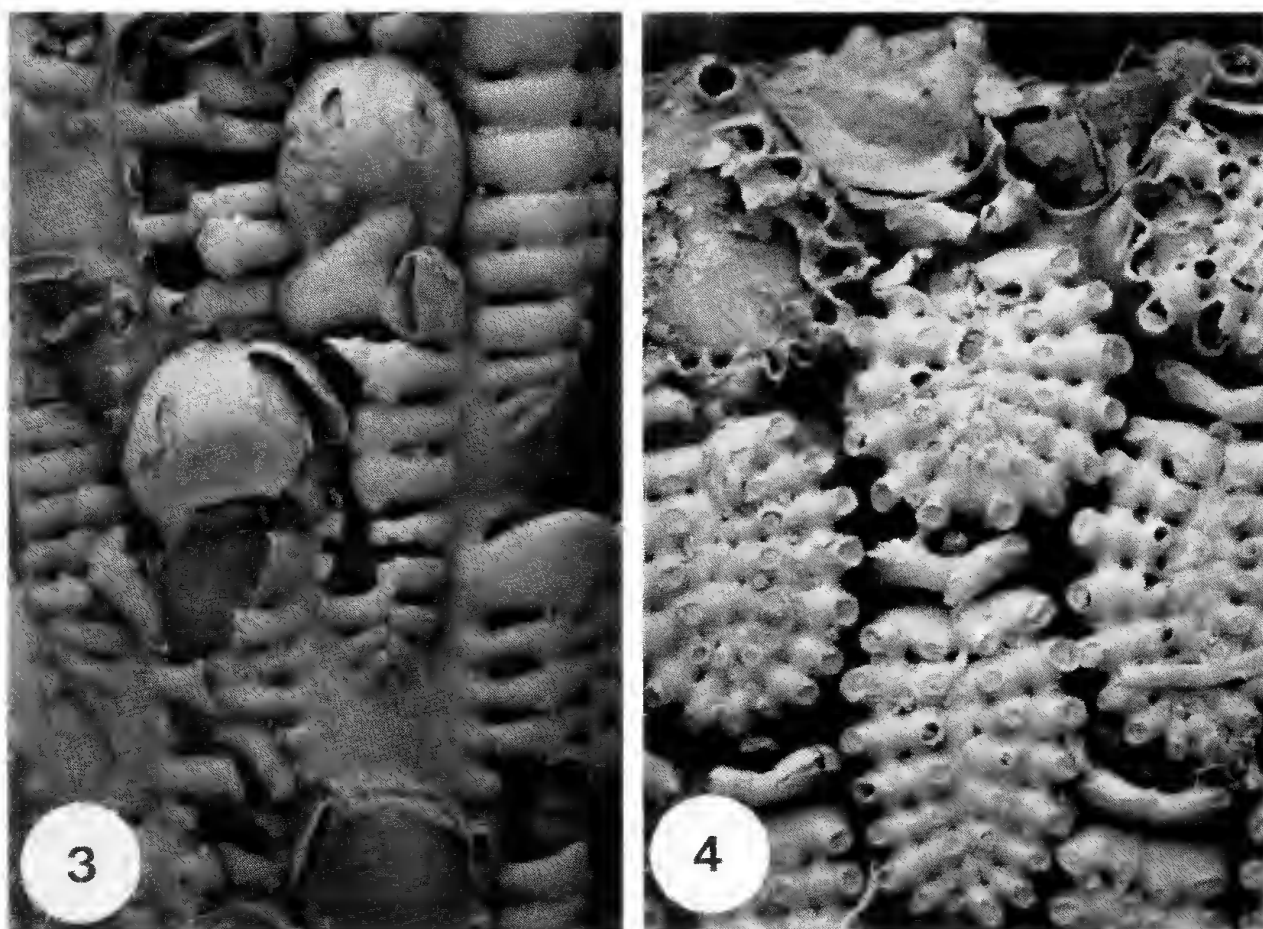
*Corbulipora* MacGillivray, 1895:60; Wass 1975:168; Bock & Cook, 1994:33; in press.

*Corbulipora inopinata* sp.nov.  
(Figs 1-6)

*Material Examined*: HOLOTYPE MOV, F80665, GAB Stn 049, subcolony including phase-2 developing into phase-3 and then repeating phase-2.



FIGURES 1-2. *Corbulipora inopinata* sp.nov. 1, subcolony showing phase-2 autozooids and two ovicelled zooids at the proximal end (arrowed). Intermediate zooids leading to two astogenetic generations of phase-3 zooids at the growing tip (GAB Stn 049) X22; 2, phase-3 subcolony with marginal pore chambers and autozooids with occluded orifices (GAB Stn 020) X40.



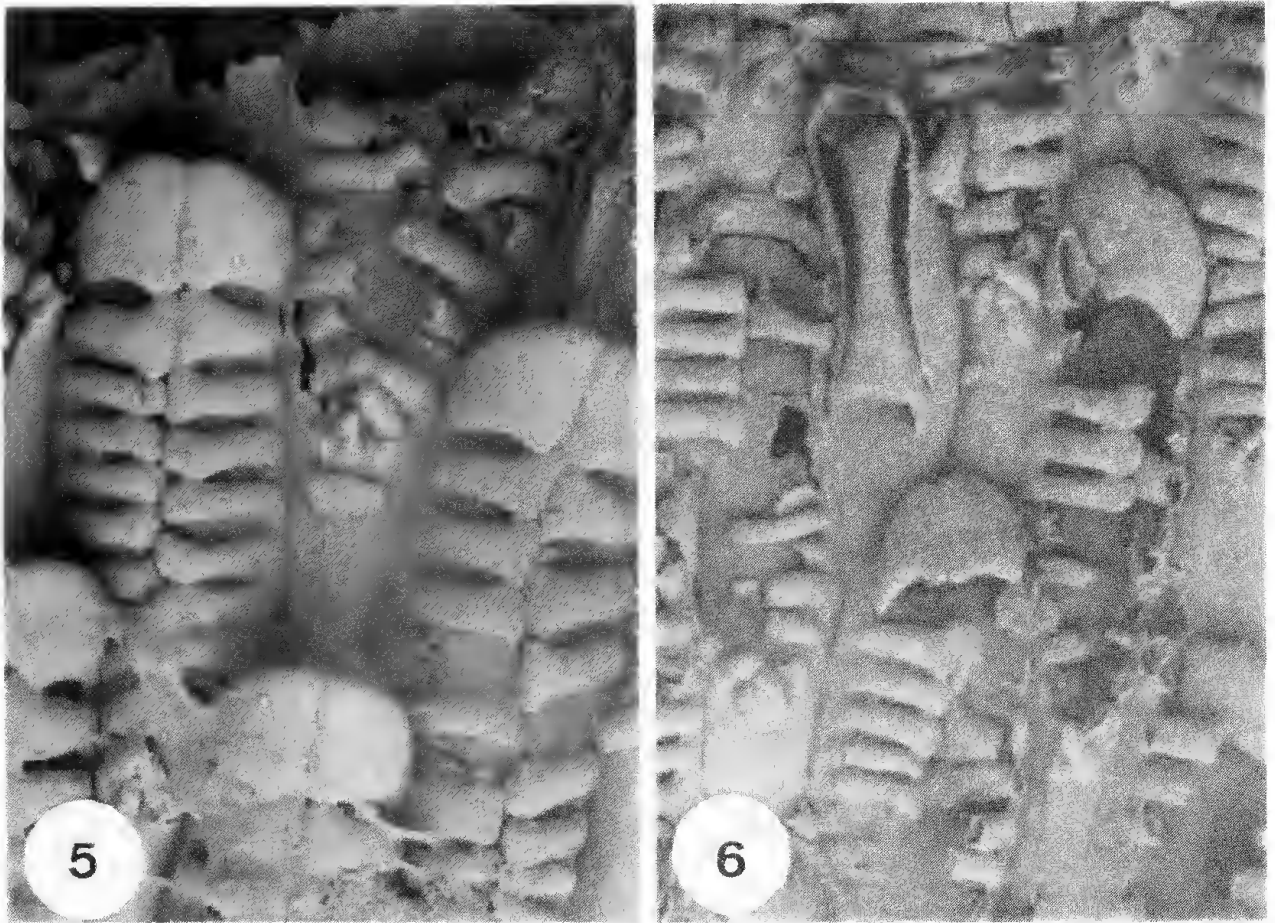
FIGURES 3–4. *Corbulipora inopinata* sp.nov. 3, phase-2 zooids with ovicells and simple frontal spines (GAB Stn 049, see also Fig.1). X80; 4, phase-3 zooids with complex frontal shields (GAB Stn 049, see also Fig.1) X70.

Paratypes: Rest of material, including SAM L755, GAB Stn 049 part.

#### Description

*Corbulipora* with colony including three subcolony phases. Primary phase encrusting, ancestrula not seen; primary triad zooids with frontal shield of 16 simple spines. All zooids with a distinct, smooth gymnocyst, and communicating through small pore-chambers. Remaining primary-phase zooids with frontal shields with 16–18 spines, separated by 3–4 series of small lacunae and with two concentric series of raised pelmatidia. Calcified orifice with 3 spines, lateral pair often bifid. Second, flustrine phase inferred to arise from primary phase. Fronds developing from stalk kenozooids and elongated autozooids, often in quadriserial groups; series bifurcating to form fronds 10–12 zooids wide and 150 astogenetic generations long, bifurcating up to 4 times. Autozooids with distinct gymnocyst and 14–16 flattened spines

overarching the frontal membrane. Brooding zooids with enlarged, curved, sometimes medially fused oral spines and large hyperstomial ovicell. Ovicell frontal with median suture and paired entoecial areas. Avicularia scattered, rare in presence of ovicells. Rostrum elongated, narrow, not raised distally; slightly expanded and rounded terminally, mandible hinged on a delicate bar, orientated distally. Tips of fronds with 3–4 astogenetic generations of zooids with intermediate morphologies leading to the third, bilaminar phase subcolonies. These form small, expanded groups of zooids with shields similar to phase-1 subcolonies, with two concentric series of raised pelmatidia. Zooids have a small orifice, sometimes partially occluded by the fusion of enlarged oral spines. Numerous rhizoids develop from marginal pore-chambers, together with stalk kenozooids and elongated stalk autozooids with a small opesia and marginal spines, which are the origin of repeated subcolonies of phase-2.



FIGURES 5-6. *Corbulipora inopinata* sp. nov. 5, phase-2 autozooids, note enlarged pair of distal spines (GAB Stn 098) X100; 6, phase-2 autozooids and avicularium (GAB Stn 098) X80.

#### Etymology

*Inopinus* L. — unexpected: referring to the occurrence of a second Recent species of *Corbulipora* with multiphase growth.

#### Remarks

The three phases of *C. inopinata* resemble those of *C. tubulifera* closely, but differ in several respects. The most noticeable difference is in the occurrence of a spinous shield in the autozooids of the second, flustrine phase. The spines are flattened and generally do not fuse centrally, although the enlarged suboral spines of marginal zooids may be fused. In addition, the avicularia of *C. inopinata* are much narrower, and are not raised distally, as are those in *C. tubulifera*, and the mandibles are hinged on a delicate, but complete bar. The palatc is much longer in proportion to the proximal gymnocyst than in *C. tubulifera*. Other differences are small, but distinct and consistent. Although no ancestrula has been preserved, one of the small, phase-1 colonies encrusting *Turritella* from Stn GAB 083

possesses a post-ancestrular triad of very small zooids. These all have a shield of simple spines, very similar to the one post-ancestrular zooid of the triad in *C. ornata* (Bock & Cook, in press, fig. 1). Subsequent zooids have two series of pematidia, which do not develop until later in astogeny in *C. tubulifera*. The orifices of this stage are also wider than those of *C. tubulifera*. No stalk zooids have been preserved arising from the encrusting phase in *C. inopinata*, but by analogy with *C. tubulifera*, these are presumed to be identical with those which arise from phase-3 bilaminar subcolonies. These consist of one or two pairs of kenozooids 2.5mm long, often accompanied or succeeded by one or more pairs of elongated zooids 2mm long, each with a small opesia surrounded by 8-12 short, simple spines. Thus the stalks differ from those of *C. tubulifera* in being more robust, with more zooidal elements, and in the occurrence of autozooids with an opesia, rather than kenozooids, early in astogeny. The zooids of intermediate morphology at the tips of the flustrine phase-2 fronds attain a complete

shield of phase-3 autozooids within 4 astogenetic generations. First, the flattened spines fuse medially, leaving a row of small lacunae. A single series of pematidia develops on the spines of the next generation of zooids, and a paired series, with 3–4 lacunae, develops on the shields of subsequent generations. The small calcified orifice is complete within the next generation or two. Although the general appearance of the autozooids of the bilaminar phase is very like those of *C. tubulifera*, they have a smaller orifice. Although these are often partially occluded by the oral spines, they do not usually exhibit the series of changes resulting in complete closure of the orifice which occurs in *C. tubulifera* (Wass 1975). In one specimen from GAB Stn 020, the spines are enlarged and nearly occlude the orifice (Fig. 2).

One of the specimens from GAB Stn 013 illustrates the relationship and probable functions of phase-2 and phase-3 subcolonies particularly well. It consists of a small bilaminar phase-3 subcolony comprising approximately 60 autozooids. More than 50 rhizoids arise from the marginal pore-chambers, and on one face of the subcolony these are involved with and adhere to minute shell and bryozoan fragments. On the edge of the other face, one quadriserial stalk, 15mm

long, consisting of two generations of quadriserial kenozooids and 10–12 generations of elongated autozooids, gives rise to a phase-2 flustrine subcolony about 30mm long, with more than 40 astogenetic generations. It seems almost certain that the one face of the bilaminar phase was buried in the surface sediments, whereas the flustrine frond extended above the surface. This subcolony is quite small; two flustrine subcolonies from Stn 056 extend up to 70mm and include 10,000 to 12,000 zooids, many of which are ovicelled. These would protrude well above the surface of the bottom sediment, allowing the larvae to be released easily.

The similarities in phase structure found in *C. inopinata* and *C. tubulifera* reinforce the inferences previously made by Bock and Cook (1994; in press) as to the nature and relationships of the known phases in *C. ornata* and *C. suggerens*, from the Victorian Tertiary. They also strongly suggest that the ovicellate phase of *C. suggerens* was a thinly calcified cellularine subcolony type, which has not been preserved as a fossil.

*C. inopinata* occurs in the western Bight together with *C. tubulifera*, but from shallower waters. In Bass Strait, and from Tasmania, *C. tubulifera* is known from a wide range in depth from 40m to 800m. It appears to be at the limits of its range south east of Eucla, in deep water. Wass (1975) first described *Corbulipora oriparma*, which is the bilaminar phase of *C. tubulifera*, from three localities. The holotype was from northeast Tasmania, the other specimens were from the eastern part of the South Australian coast. Subsequently, Wass and Yoo (1983) recorded *C. oriparma* from 12 localities, extending from near Perth to southwest of Eucla. These are similar to many of the localities from which specimens have been recently examined, and which have produced *C. inopinata*. None of Wass and Yoo's (1983) localities was from a greater depth than 158 m, far shallower than the most westerly known locality for *C. tubulifera*. Only examination of the specimens recorded by Wass and Yoo (1983) can decide their identity.

#### ACKNOWLEDGMENTS

We should like to thank Dr Yvonne Bone (University of Adelaide) and the Master and crew of CSIRO R.V. 'Franklin' for the opportunity for one of us (P.E.B.) to take part in the sampling programme in July 1995, which led to the discovery of the species described here. We are also grateful to Mr D. McDonald for his help in preparation of this paper.

TABLE 1. Comparative measurements in mm of *Corbulipora inopinata* sp.nov. and *C. tubulifera* (Hincks). Lz, lz length and width of autozooid; lo, width of orifice; Lov, lov, length and width of ovicell; Lav, lav, length and width of avicularium; Lp, length of avicularian palate.

Character	<i>C. inopinata</i>	<i>C. tubulifera</i>
Phase 1 (including primary zooids in mms)		
Lz	0.41 – 0.70	0.45 – 0.74
lz	0.35 – 0.50	0.38 – 0.50
lo	0.12 – 0.17	0.10 – 0.13
Phase 2		
Lz	0.98 – 1.30	0.78 – 1.32
lz	0.26 – 0.29	0.25 – 0.33
Lov	0.21 – 0.23	0.23 – 0.27
lov	0.24 – 0.26	0.28 – 0.33
Lav	0.60 – 0.75	0.65 – 0.96
lav	0.15 – 0.17	0.22 – 0.26
Lp	0.43 – 0.51	0.31 – 0.35
Phase 3		
Lz	0.50 – 0.75	0.54 – 0.87
lz	0.37 – 0.50	0.32 – 0.54
lo	0.09 – 0.10	0.10 – 0.14

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